a robot controller having a software processing ability], said method including the steps of:

transferring existing position data [previously obtained on] indicating a start point, an end point and junction points between sections on a weld line to the robot controller;

for each section inputting a forward angle[, or] which is an inclined angle of the welding torch [to the] with reference to a direction of [a] the section, [for each section];

obtaining a reference plane by teaching, or selecting any one of planes previously [prepared] stored in [the] a robot controller as a reference plane, and then inputting for each section, an inclination angle[, or] which is an inclined angle of the welding torch with respect to the reference plane [, for each section];

[determining] calculating, in software, a desired torch orientation for the length of each section [by a software calculation processing, on the basis of] based on the data on the respective points transferred to said robot controller, and said inputted inclination angle and said forward angle;

setting auxiliary points in the periphery of the junction point, for [a] each junction point that connects a straight-line section with another straight line section[, among said junction points]; and

allocating the torch orientation, in software, for each of the set auxiliary points and junction points [by the software calculation processing] according to the arrangement of the points, so that the torch orientation is changed gradually from said desired torch orientation in the section [behind] after the junction point to said desired torch orientation in the section before the junction point.

2. (ONCE AMENDED) A method for teaching a welding torch orientation for executing the arc welding by a welding torch supported by a robot [by the use of a

robot controller having a software processing ability], said method including the steps of:

teaching the position of a start point, an end point and junction points between sections on a weld line by a robot jog feed operation[,] without imposing a specific condition on the torch orientation;

for each section inputting a forward angle[, or] which is an inclined angle of the welding torch to the direction of [a] the section[, for each section];

obtaining a reference plane by teaching, or selecting any one of planes previously [prepared] stored in [the] a robot controller[s] as a reference plane, and then inputting, for each section, an inclination angle[, or] which is an inclined angle of the welding torch with respect to the reference plane[, for each section];

[determining] calculating a desired torch orientation, in software, for each section [by a software calculation processing,] on the basis of the taught data on the respective points, and said inputting inclination angle and said forward angle;

setting auxiliary points in the periphery of [the] a junction point[,] for [a] each junction point that connects a straight-line section with another straight-line section[, among said junction points]; and

allocating the torch orientation for each of the set auxiliary points and junction points [by the] in software, [calculation processing] according to the arrangement of the points, so that the torch orientation is changed gradually from said desired torch orientation in the section [behind] after the junction point to said desired torch orientation in the section before the junction point.

3. (ONCE AMENDED) A method for teaching a welding torch orientation as set forth in claim 2, wherein [in executing] during the calculation of said basic welding orientation [by the software processing], the state at the time of teaching by said jog feed operation is further reflected for the orientation around a torch axis.

4. (ONCE AMENDED) A method of teaching a welding torch orientation as set forth in claim 1, [2 or 3] wherein said reference plane is defined by teaching a required plane to said robot.

5. (ONCE AMENDED) A method of teaching a weld torch orientation for executing the arc welding by a welding torch supported by a robot, said method comprising the steps of:

(a) teaching [the] position data [on] indicating a start point of a weld line, [and] an end point of [a] the weld line[,] and [on] connection points dividing the weld line into a plurality of straight-line sections;

(b) obtaining a reference plane by teaching[,] or [by] selecting any one of planes already [prepared] stored in a robot controller;

(c) defining a three-axis rectangular coordinate system for each straight-line section[, on the basis of] based on [the] a direction of [the] a straight-line section and [of the] a normal direction of the reference plane taught or selected in [said] step (b);

(d) transforming a tool vector composed of a set of three rectangular unit vectors, including a torch direction unit vector, to an expression in the three-axis rectangular coordinate system [behind] defined in step (c);

(e) calculating [first] a taught inclination angle and a taught forward angle from the tool vector expressed in the three-axis rectangular coordinate system, the inclination angle being defined as an angle of the welding torch with respect to the plane, and the forward angle as an angle of the welding torch with respect to the direction of the section, and then, on the basis of these angles, determining a taught spin angle as a taught orientation with the torch direction taken as [a] an axis;

(f) calculating the tool vector expressed in the three-step rectangular coordinate system determined in [said] step (c), from the taught spin angle obtained

in [said] step (e), a forward angle specified by input, and an inclination angle specified by input;

(g) obtaining a basic welding orientation [in] for said straight-line section, by transforming the calculated tool vector obtained in [said] step (f) to [the] an expression in the base coordinate system;

(h) setting [one or two or more] at least one auxiliary point[s] spaced apart [from each other] by a predetermined distance in the straight-line section at least one of before and [or behind] after a junction point, with the junction point as a reference;

(i) specifying the basic welding orientation for the straight-line section defined in [said] step (g) to an auxiliary point at the position most apart from the junction point in the forward/rearward straight-line section, among auxiliary points set in [said] step (h); and

(j) allocating the torch orientation for any remaining auxiliary points and said junction points according to the arrangement of the points, so that the torch orientation is changed gradually from the basic torch orientation for one straight-line section defined in [said] step (g) to the basic torch orientation for the [other] next straight-line section.

Please ADD the following new claims:

6. (NEW) A method of teaching a welding torch orientation as set forth in claim 2, wherein said reference plane is defined by teaching a required plane to said robot.

7. (NEW) A method of teaching a welding torch orientation as set forth in claim 3, wherein said reference plane is defined by teaching a required plane to said robot.